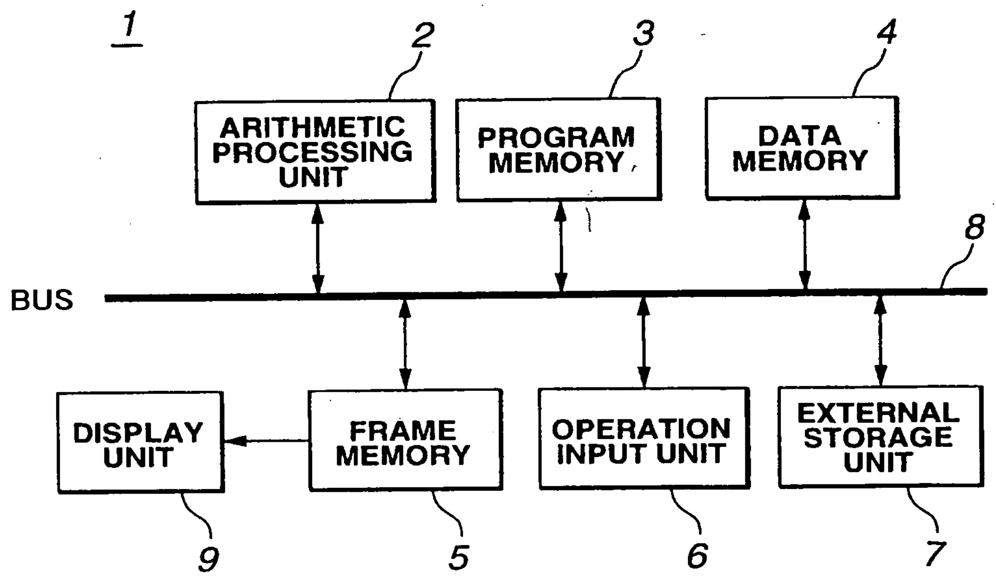
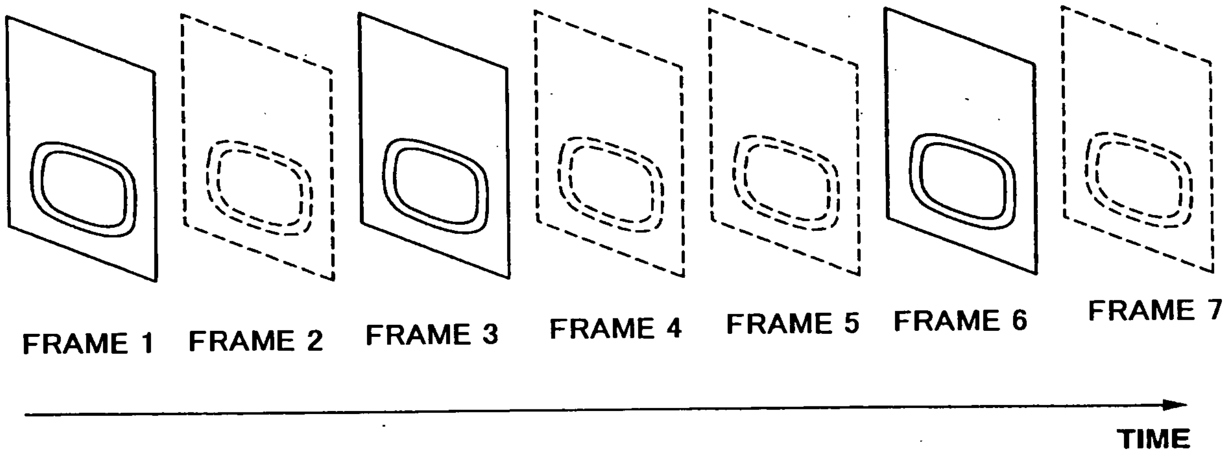
[DOCUMENT NAME] D[illegible]WING

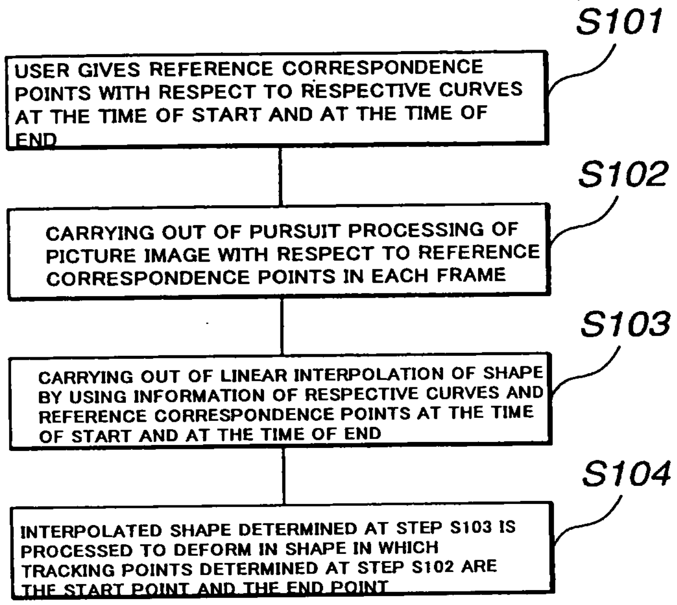
[FIG. 1]



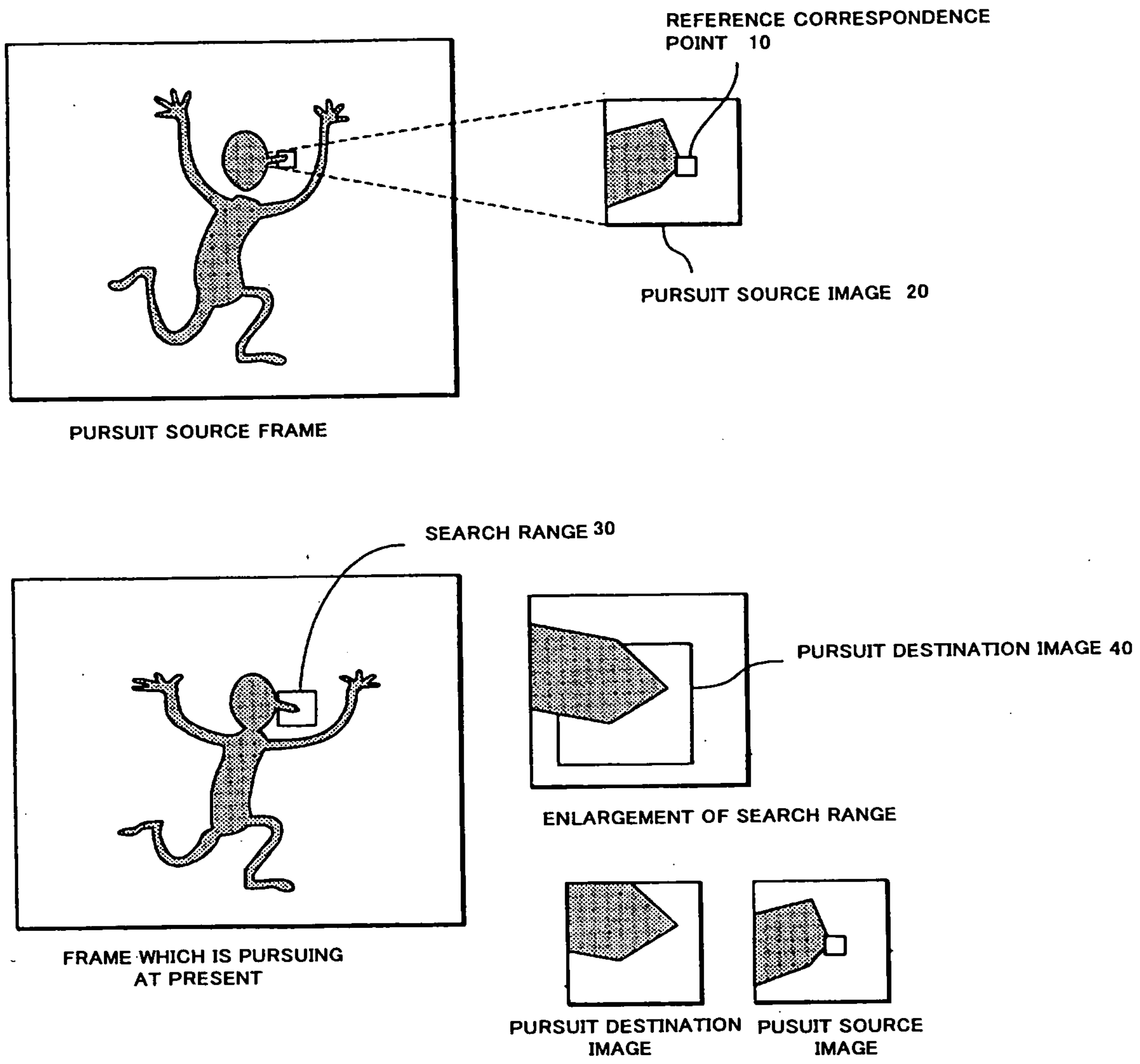
[FIG. 2]



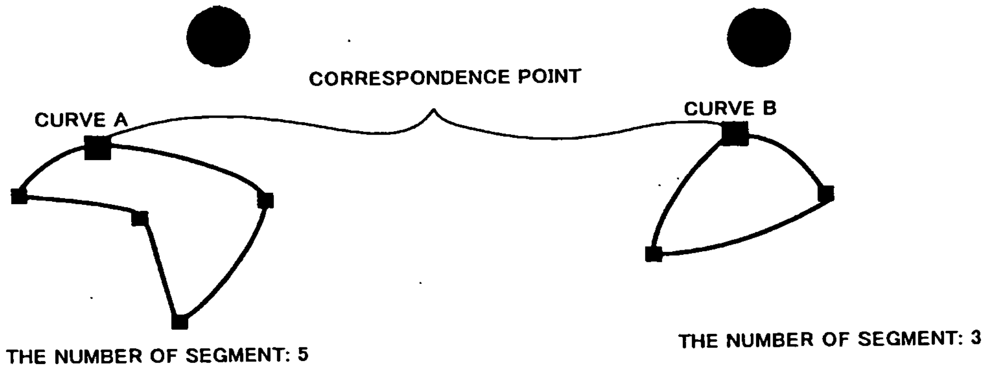
[FIG. 3]


S101
USER GIVES REFERENCE CORRESPONDENCE POINTS WITH RESPECT TO RESPECTIVE CURVES AT THE TIME OF START AND AT THE TIME OF END
S102
CARRYING OUT OF PURSUIT PROCESSING OF PICTURE IMAGE WITH RESPECT TO REFERENCE CORRESPONDENCE POINTS IN EACH FRAME
S103
CARRYING OUT OF LINEAR INTERPOLATION OF SHAPE BY USING INFORMATION OF RESPECTIVE CURVES AND REFERENCE CORRESPONDENCE POINTS AT THE TIME OF START AND AT THE TIME OF END
S104
INTERPOLATED SHAPE DETERMINED AT STEP S103 IS PROCESSED TO DEFORM IN SHAPE IN WHICH TRACKING POINTS DETERMINED AT STEP S102 ARE THE START POINT AND THE END POINT

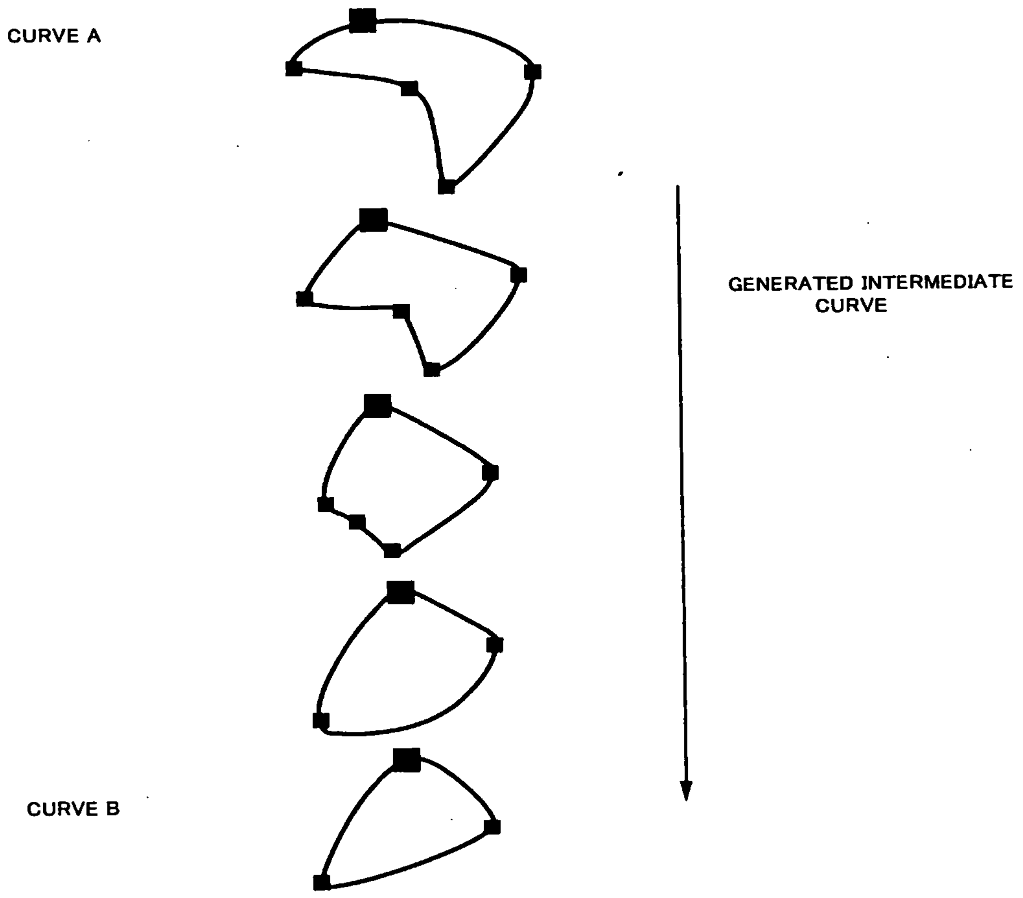
[FIG. 4]


REFERENCE CORRESPONDENCE POINT 10
PURSUIT SOURCE IMAGE 20
PURSUIT SOURCE FRAME
SEARCH RANGE 30
PURSUIT DESTINATION IMAGE 40
ENLARGEMENT OF SEARCH RANGE
FRAME WHICH IS PURSUING AT PRESENT
PURSUIT DESTINATION IMAGE
PUSUIT SOURCE IMAGE

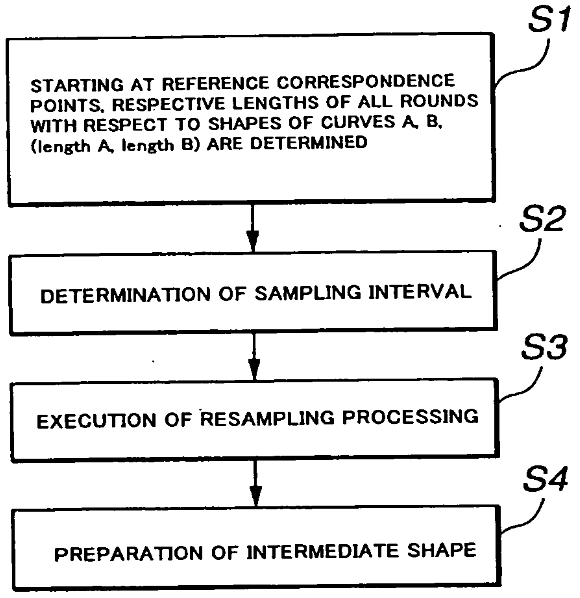
[FIG. 5]


CORRESPONDENCE POINT
CURVE A
CURVE B
THE NUMBER OF SEGMENT: 5
THE NUMBER OF SEGMENT: 3

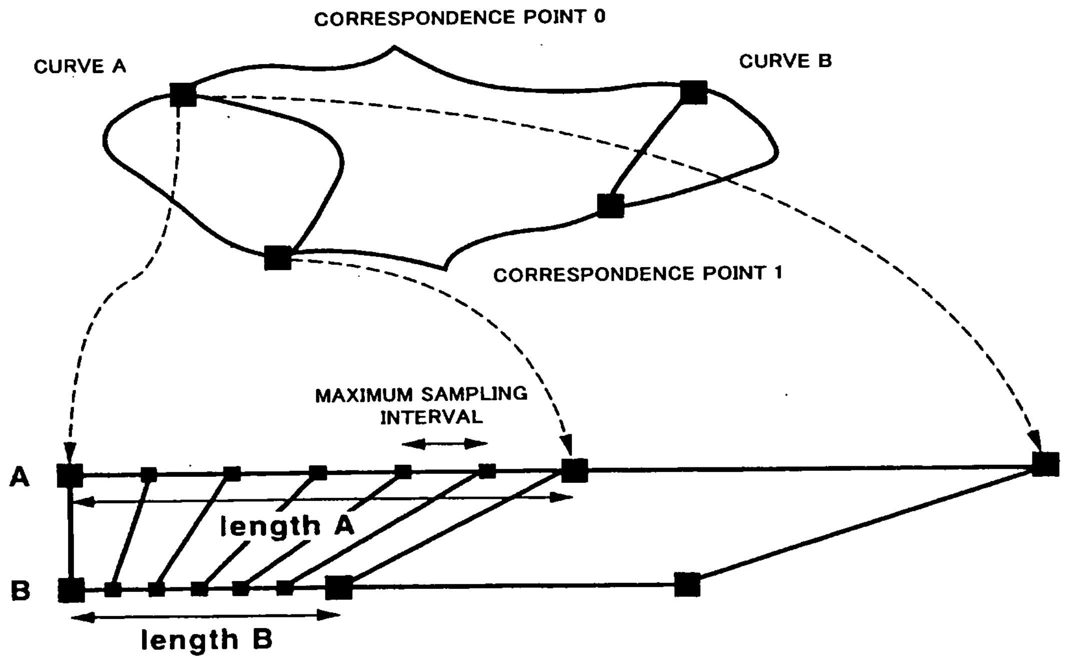
[FIG. 6]


CURVE A
GENERATED INTERMEDIATE CURVE
CURVE B

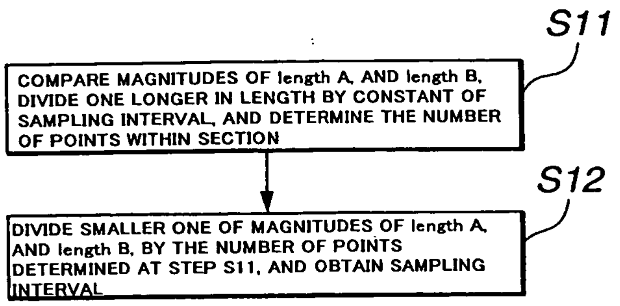
[FIG. 7]


S1
STARTING AT REFERENCE CORRESPONDENCE POINTS, RESPECTIVE LENGTHS OF ALL ROUNDS WITH RESPECT TO SHAPES OF CURVES A, B, (length A, length B) ARE DETERMINED
S2
DETERMINATION OF SAMPLING INTERVAL
S3
EXECUTION OF RESAMPLING PROCESSING
S4
PREPARATION OF INTERMEDIATE SHAPE

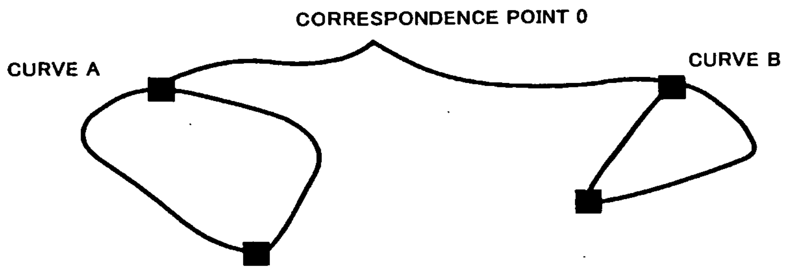
[FIG. 8]


CORRESPONDENCE POINT 0
CURVE A
CURVE B
CORRESPONDENCE POINT 1
MAXIMUM SAMPLING INTERVAL
A
length A
B
length B

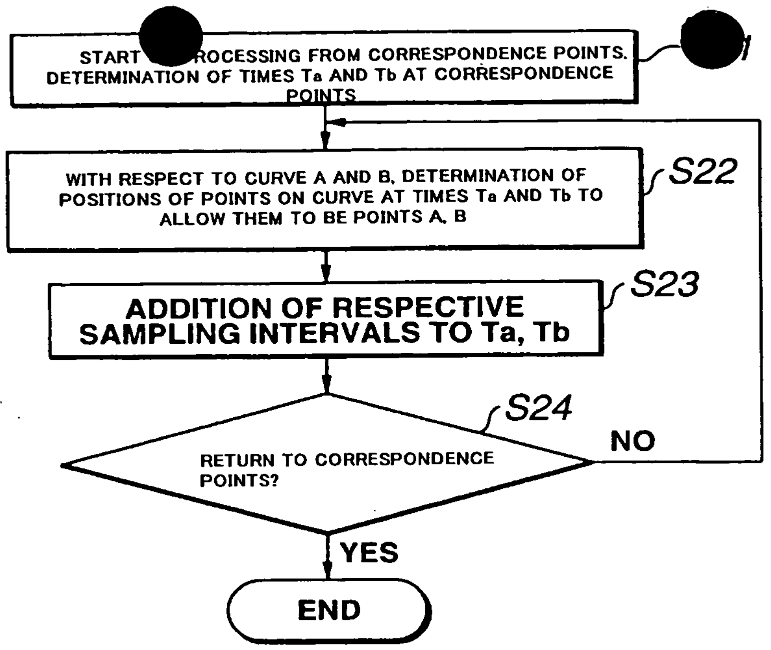
[FIG. 9]


S11
COMPARE MAGNITUDES OF length A, AND length B, DIVIDE ONE LONGER IN LENGTH BY CONSTANT OF SAMPLING INTERVAL, AND DETERMINE THE NUMBER OF POINTS WITHIN SECTION
S12
DIVIDE SMALLER ONE OF MAGNITUDES OF length A, AND length B, BY THE NUMBER OF POINTS DETERMINED AT STEP S11, AND OBTAIN SAMPLING INTERVAL

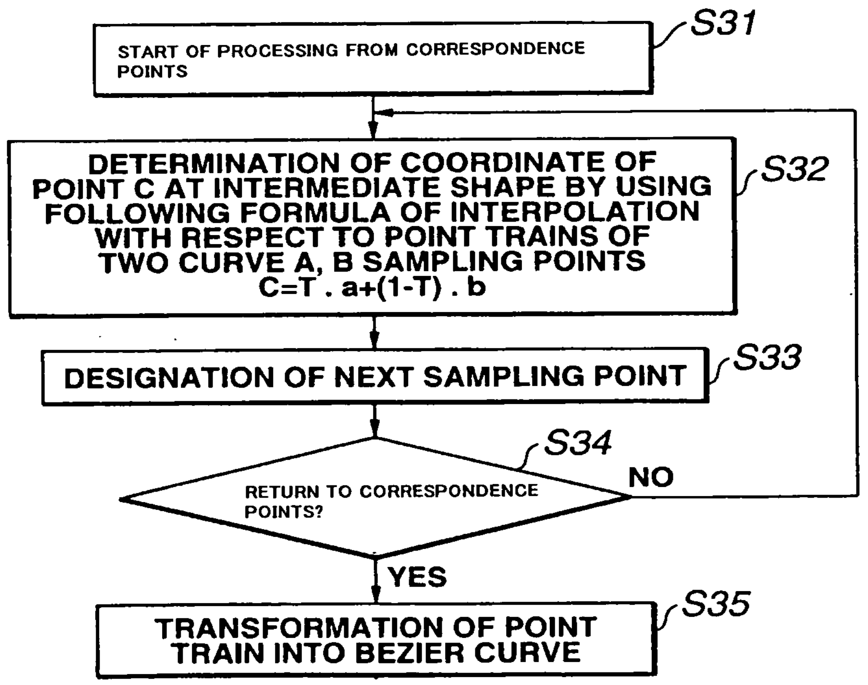
[FIG. 10]


CORRESPONDENCE POINT 0
CURVE A
CURVE B

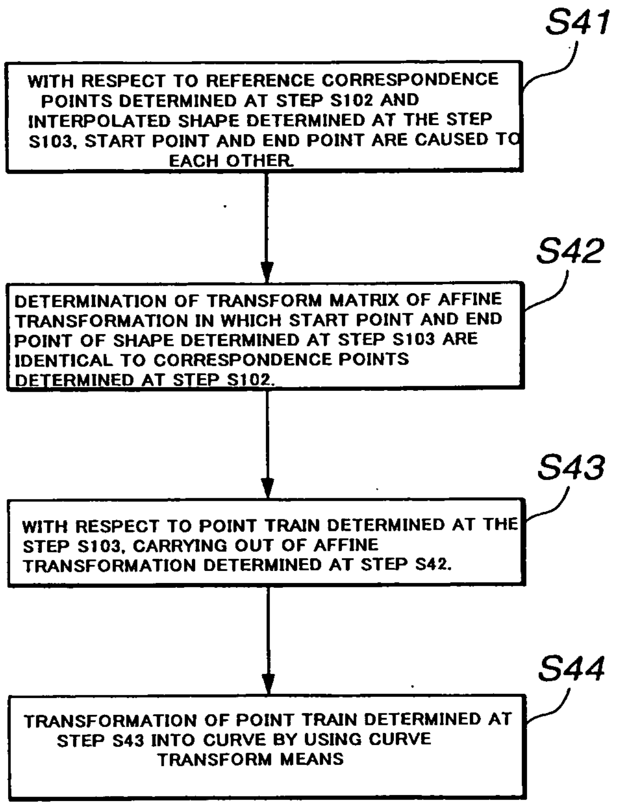
[FIG. 11]


START ROCESSING FROM CORRESPONDENCE POINTS. DETERMINATION OF TIMES Ta AND Tb AT CORRESPONDENCE POINTS
WITH RESPECT TO CURVE A AND B, DETERMINATION OF POSITIONS OF POINTS ON CURVE AT TIMES Ta AND Tb TO ALLOW THEM TO BE POINTS A, B
S22
ADDITION OF RESPECTIVE SAMPLING INTERVALS TO Ta, Tb
S23
RETURN TO CORRESPONDENCE POINTS?
S24
NO
YES
END

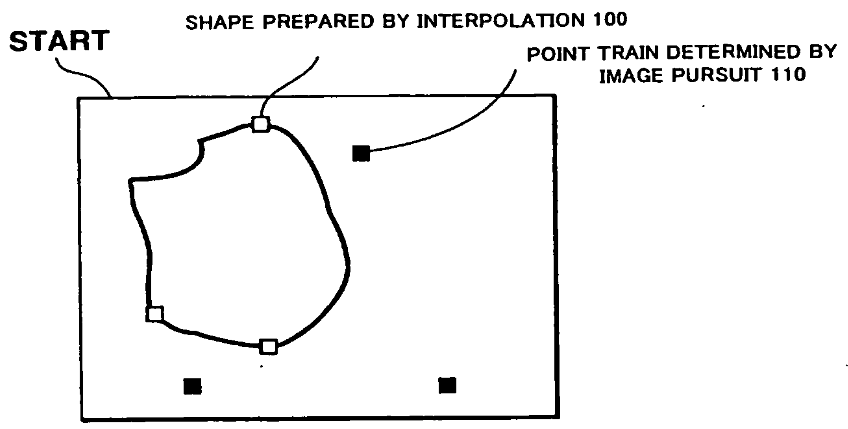
[FIG. 12]


START OF PROCESSING FROM CORRESPONDENCE POINTS
S31
DETERMINATION OF COORDINATE OF POINT C AT INTERMEDIATE SHAPE BY USING FOLLOWING FORMULA OF INTERPOLATION WITH RESPECT TO POINT TRAINS OF TWO CURVE A, B SAMPLING POINTS C=T . a+(1-T) . b
S32
DESIGNATION OF NEXT SAMPLING POINT
S33
RETURN TO CORRESPONDENCE POINTS?
S34
NO
YES
TRANSFORMATION OF POINT TRAIN INTO BEZIER CURVE
S35

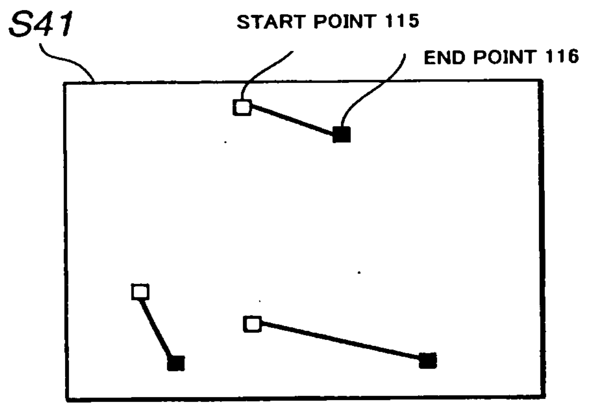
[FIG. 13]


S41
WITH RESPECT TO REFERENCE CORRESPONDENCE POINTS DETERMINED AT STEP S102 AND INTERPOLATED SHAPE DETERMINED AT THE STEP S103, START POINT AND END POINT ARE CAUSED TO EACH OTHER.
S42
DETERMINATION OF TRANSFORM MATRIX OF AFFINE TRANSFORMATION IN WHICH START POINT AND END POINT OF SHAPE DETERMINED AT STEP S103 ARE IDENTICAL TO CORRESPONDENCE POINTS DETERMINED AT STEP S102.
S43
WITH RESPECT TO POINT TRAIN DETERMINED AT THE STEP S103, CARRYING OUT OF AFFINE TRANSFORMATION DETERMINED AT STEP S42.
S44
TRANSFORMATION OF POINT TRAIN DETERMINED AT STEP S43 INTO CURVE BY USING CURVE TRANSFORM MEANS

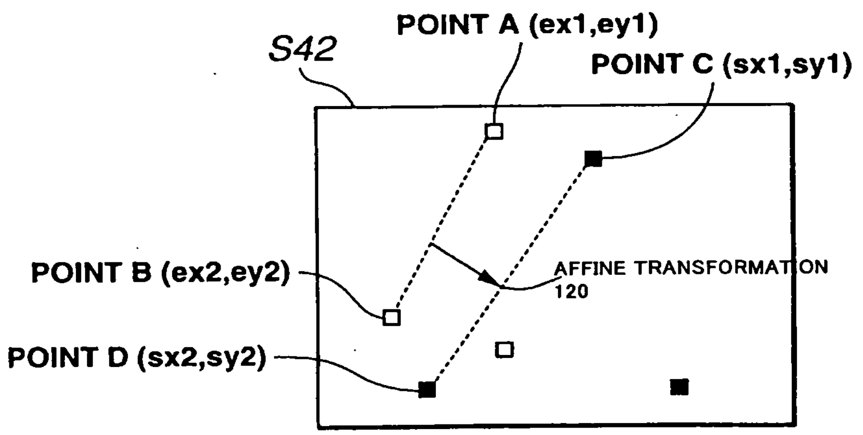
[FIG. 14]


START
SHAPE PREPARED BY INTERPOLATION 100
POINT TRAIN DETERMINED BY IMAGE PURSUIT 110

SHAPE PREPARED BY INTERPOLATION AND POINT TRAIN DETERMINED BY IMAGE PURSUIT



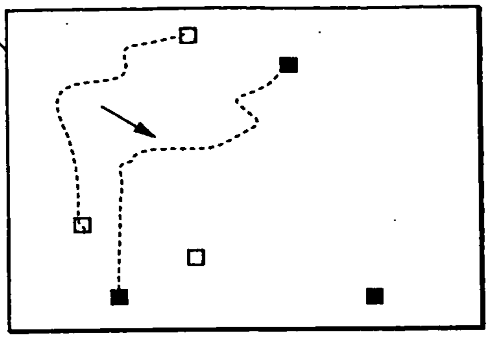
CORRESPONDENCE OF REFERENCE CORRESPONDENCE POINT



DETERMINE AFFINE TRANSFORMATION WHICH IS DEFORMED AS DESCRIBED ABOVE WITH RESPECT TO CORRESPONDENCE SECTION.

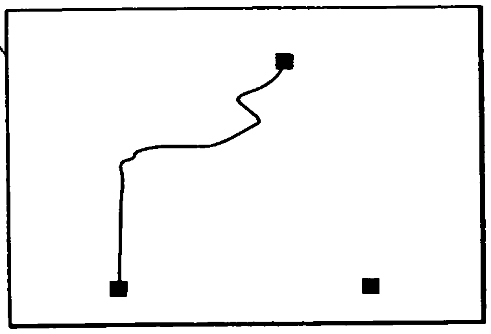
[FIG. 15]

S43



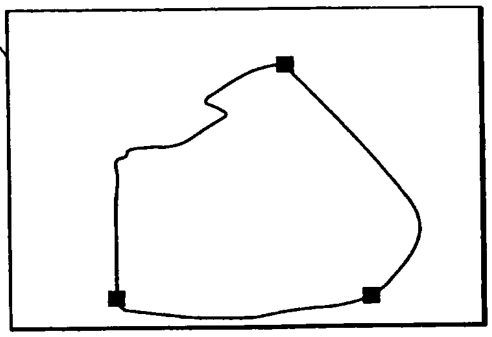
TRANSFORMING WITH RESPECT TO POINT TRAIN CONSTITUTING INTERMEDIATE SHAPE AS WELL

S44



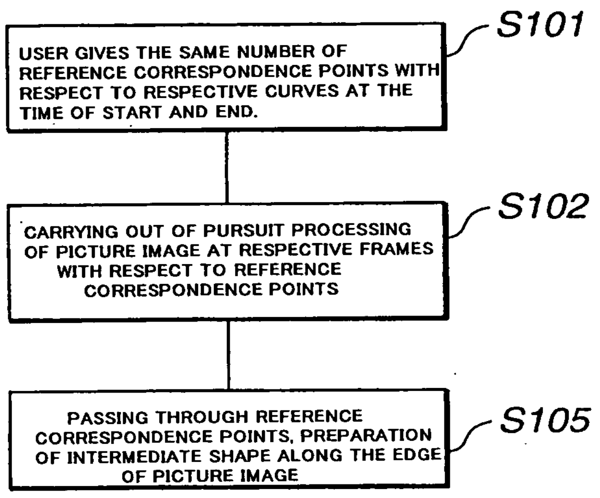
TRANSFORMING INTO BEZIER CURVE

END

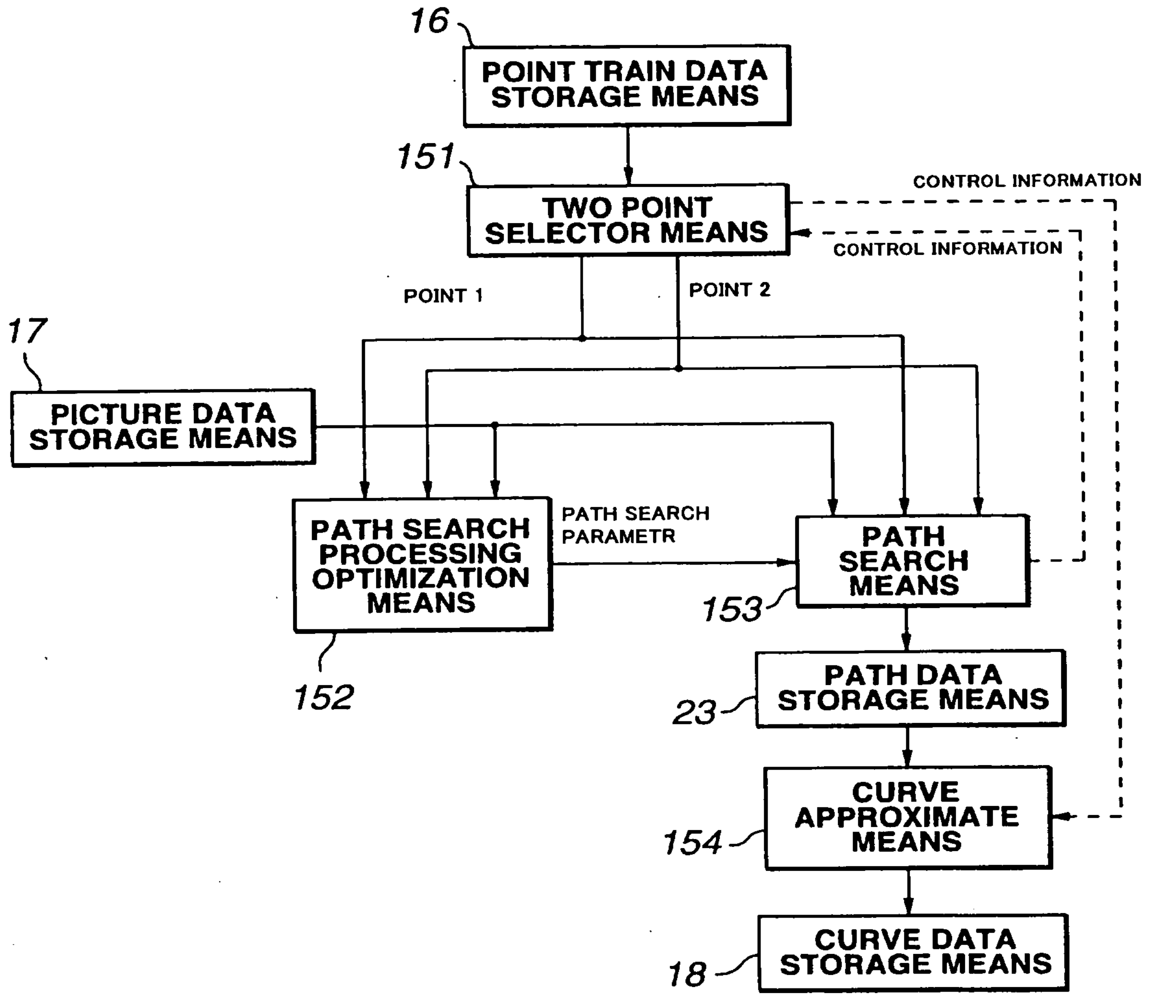


RESULT OF TRANSFORMING WITH RESPECT TO ALL SECTIONS

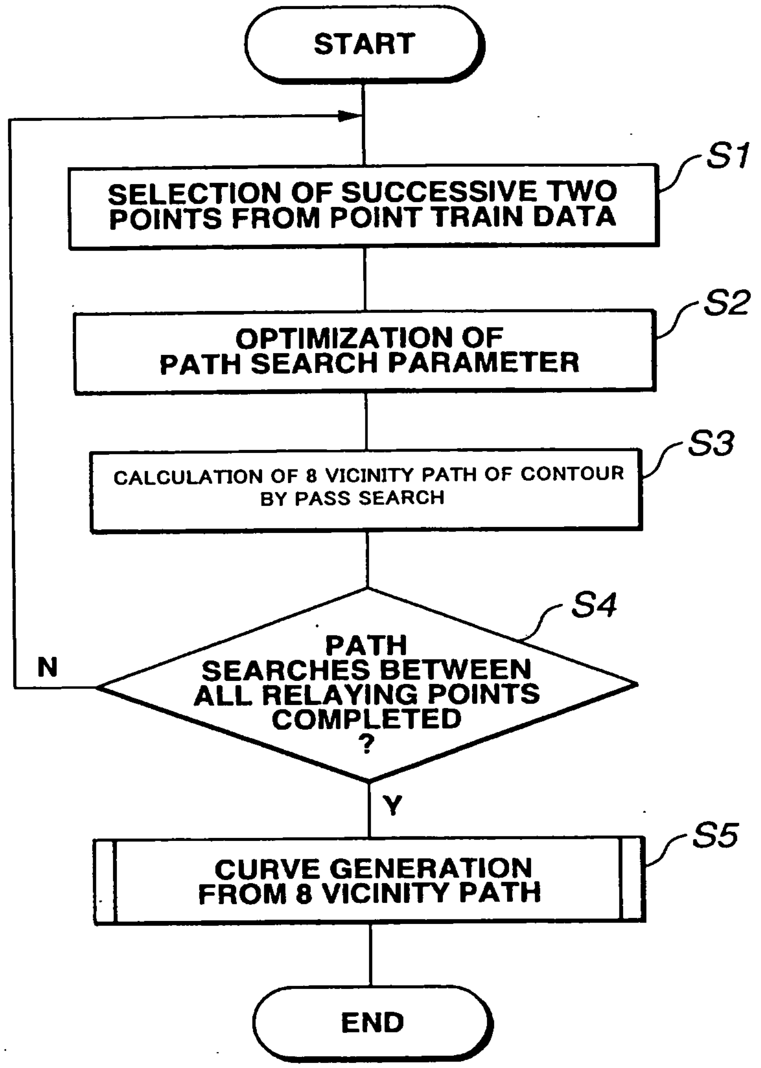
[FIG. 16]


USER GIVES THE SAME NUMBER OF REFERENCE CORRESPONDENCE POINTS WITH RESPECT TO RESPECTIVE CURVES AT THE TIME OF START AND END.
S101
CARRYING OUT OF PURSUIT PROCESSING OF PICTURE IMAGE AT RESPECTIVE FRAMES WITH RESPECT TO REFERENCE CORRESPONDENCE POINTS
S102
PASSING THROUGH REFERENCE CORRESPONDENCE POINTS, PREPARATION OF INTERMEDIATE SHAPE ALONG THE EDGE OF PICTURE IMAGE
S105

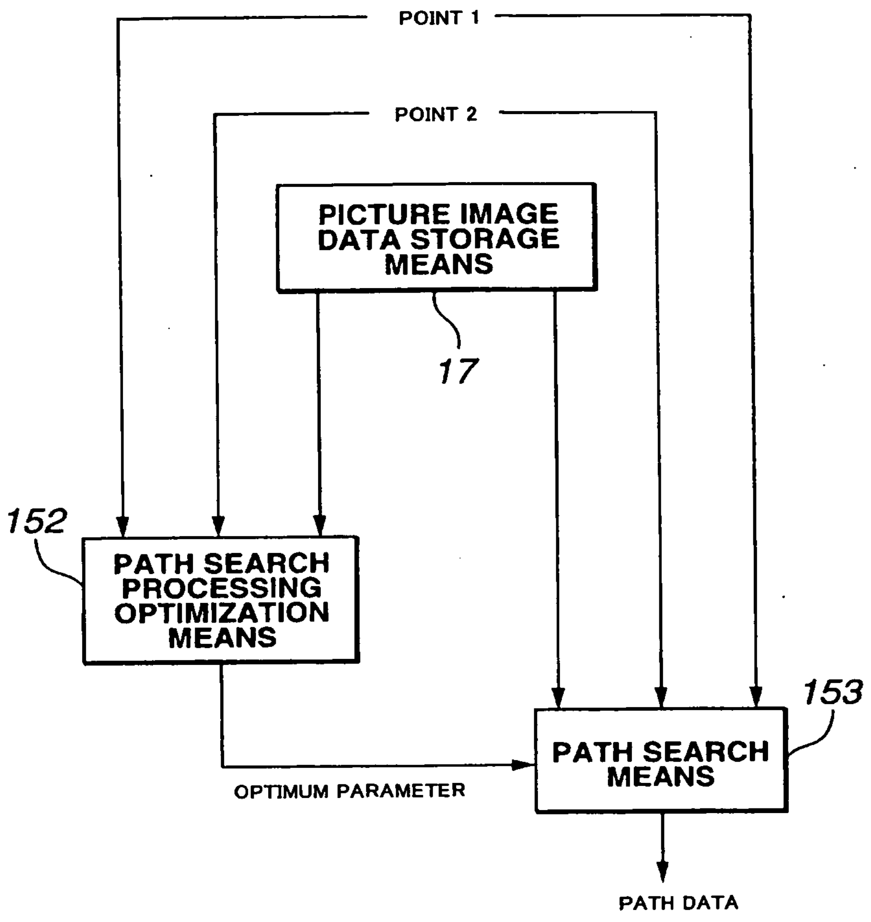
[FIG. 17]


16
POINT TRAIN DATA STORAGE MEANS
151
TWO POINT SELECTOR MEANS
CONTROL INFORMATION
CONTROL INFORMATION
POINT 1
POINT 2
17
PICTURE DATA STORAGE MEANS
PATH SEARCH PROCESSING OPTIMIZATION MEANS
152
PATH SEARCH PARAMETR
PATH SEARCH MEANS
153
PATH DATA STORAGE MEANS
23
CURVE APPROXIMATE MEANS
154
CURVE DATA STORAGE MEANS
18

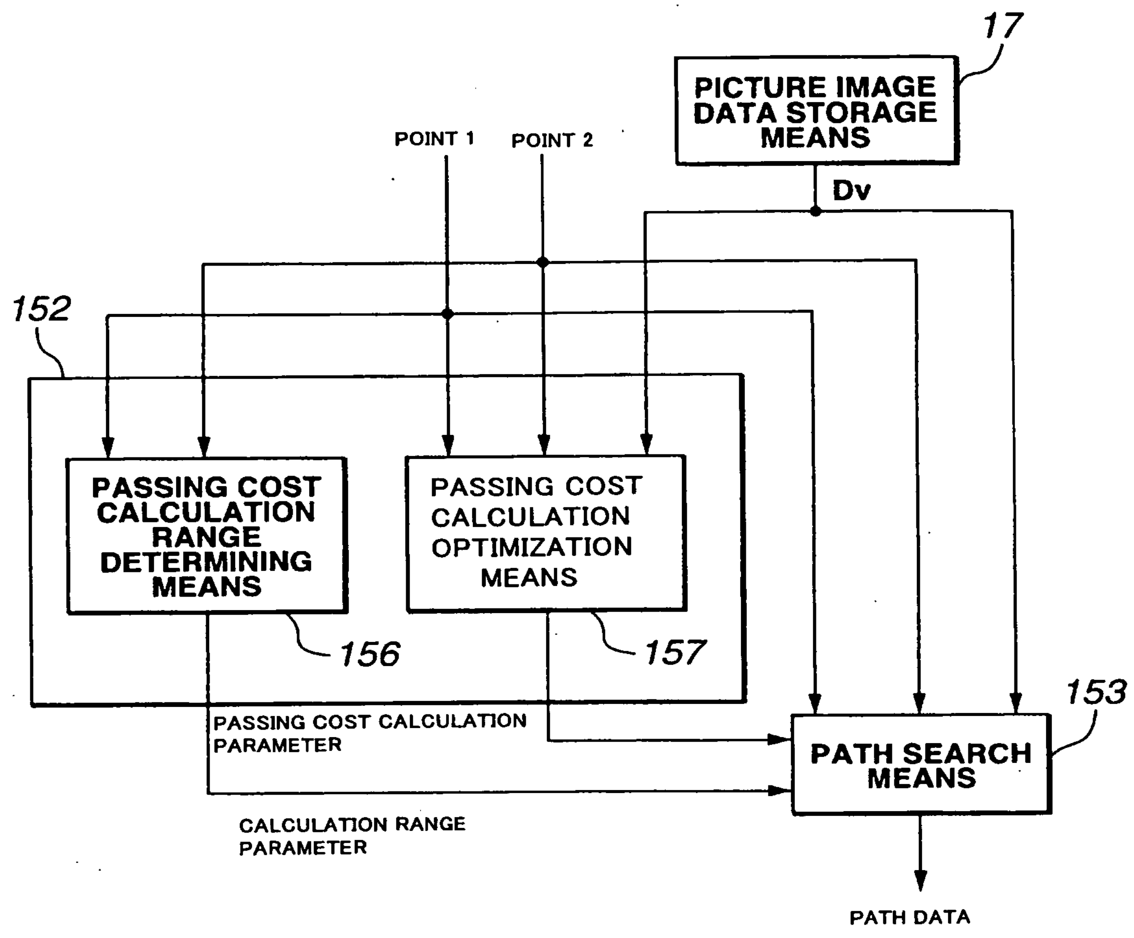
[FIG. 18]


START
SELECTION OF SUCCESSIVE TWO POINTS FROM POINT TRAIN DATA
S1
OPTIMIZATION OF PATH SEARCH PARAMETER
S2
CALCULATION OF 8 VICINITY PATH OF CONTOUR BY PASS SEARCH
S3
PATH SEARCHES BETWEEN ALL RELAYING POINTS COMPLETED ?
S4
N
Y
CURVE GENERATION FROM 8 VICINITY PATH
S5
END

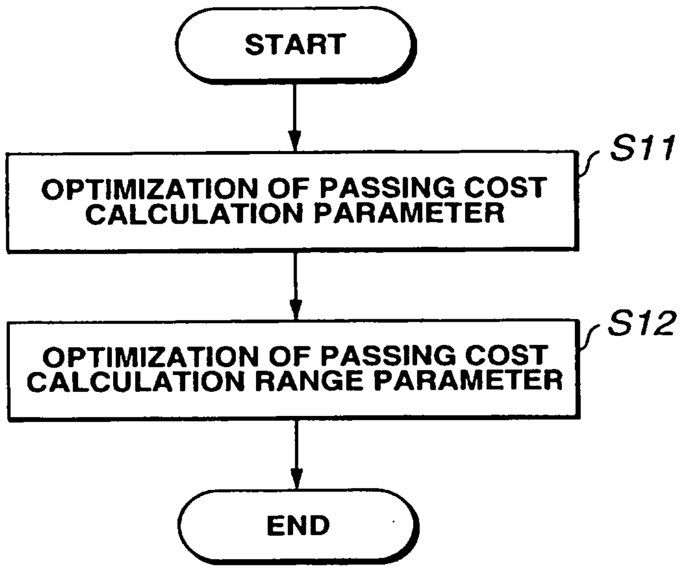
[FIG. 19]


POINT 1
POINT 2
PICTURE IMAGE DATA STORAGE MEANS
17
152
PATH SEARCH PROCESSING OPTIMIZATION MEANS
153
PATH SEARCH MEANS
OPTIMUM PARAMETER
PATH DATA

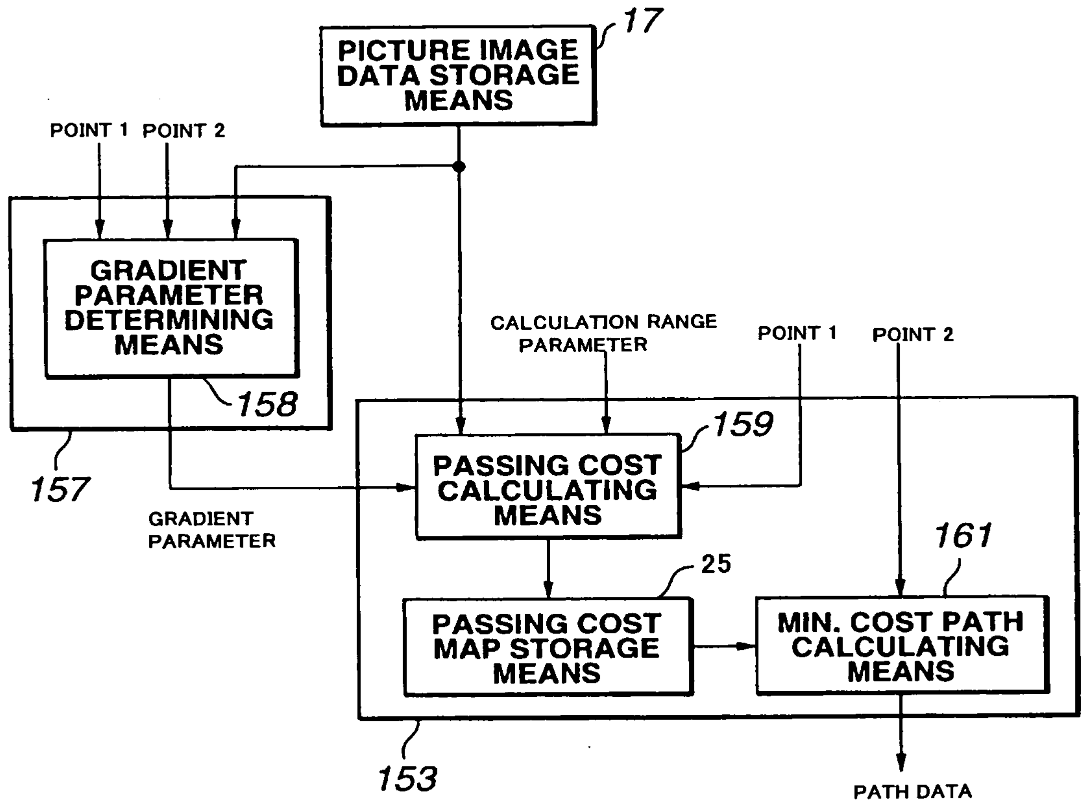
[FIG. 20]


17
PICTURE IMAGE DATA STORAGE MEANS
POINT 1
POINT 2
Dv
152
PASSING COST CALCULATION RANGE DETERMINING MEANS
PASSING COST CALCULATION OPTIMIZATION MEANS
156
157
153
PASSING COST CALCULATION PARAMETER
CALCULATION RANGE PARAMETER
PATH SEARCH MEANS
PATH DATA

[FIG. 21]

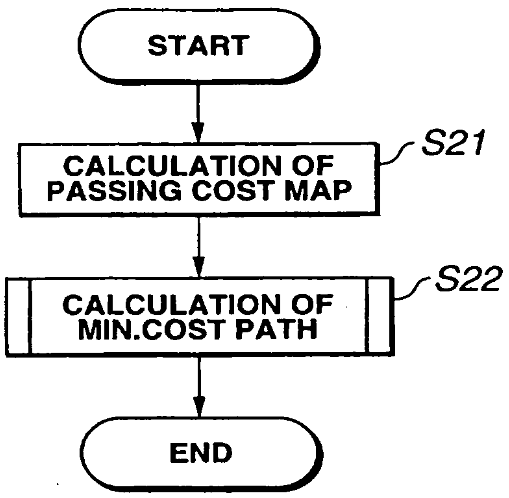

START
OPTIMIZATION OF PASSING COST CALCULATION PARAMETER
S11
OPTIMIZATION OF PASSING COST CALCULATION RANGE PARAMETER
S12
END

[FIG. 22]

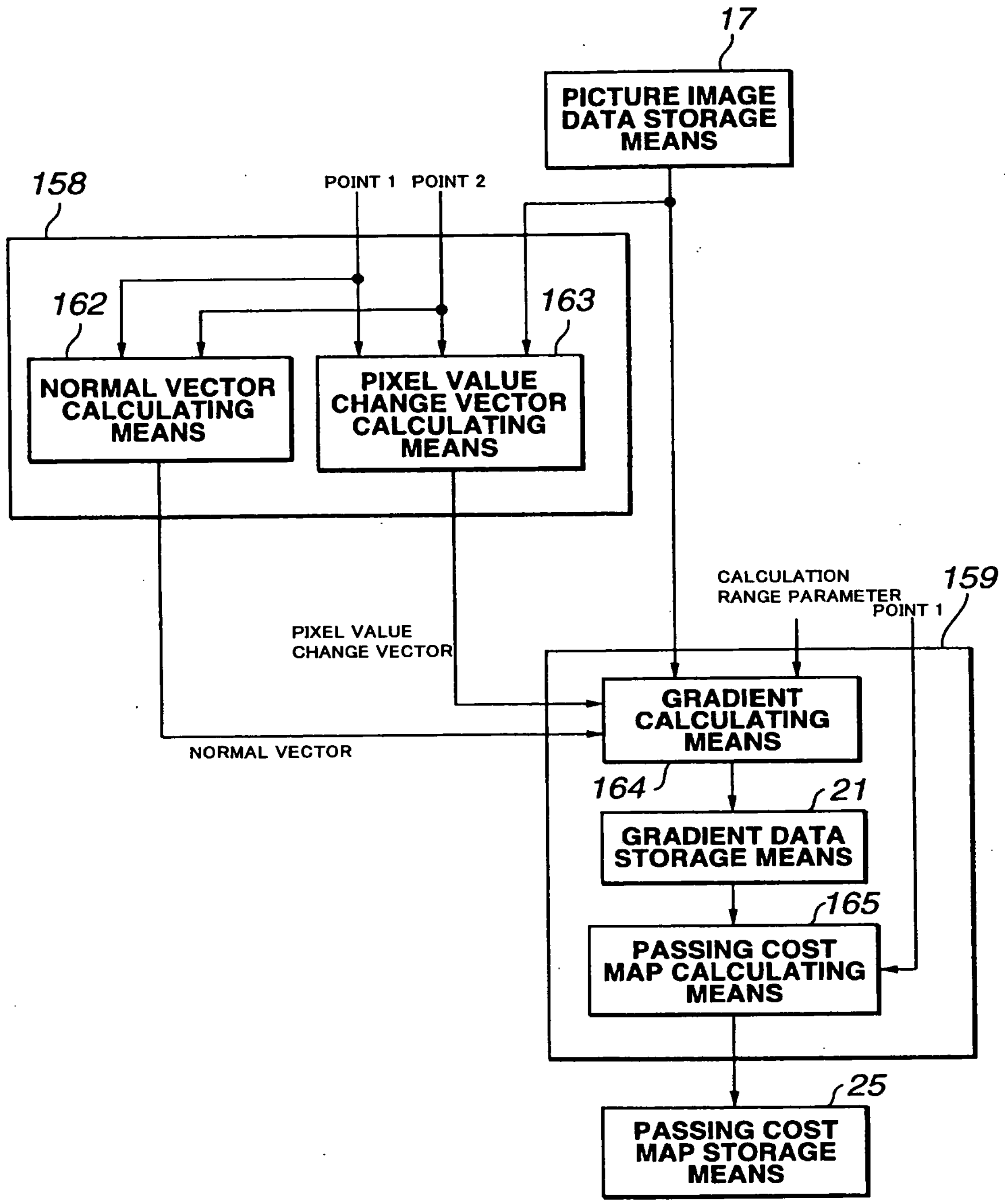


PICTURE IMAGE DATA STORAGE MEANS
17
POINT 1
POINT 2
GRADIENT PARAMETER DETERMINING MEANS
158
157
GRADIENT PARAMETER
CALCULATION RANGE PARAMETER
POINT 1
POINT 2
PASSING COST CALCULATING MEANS
159
25
161
PASSING COST MAP STORAGE MEANS
MIN. COST PATH CALCULATING MEANS
153
PATH DATA

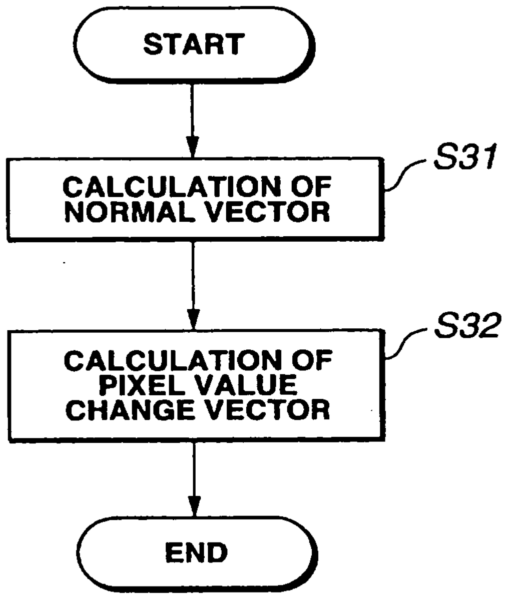
[FIG. 23]


START
CALCULATION OF PASSING COST MAP
S21
CALCULATION OF MIN.COST PATH
S22
END

[FIG. 24]

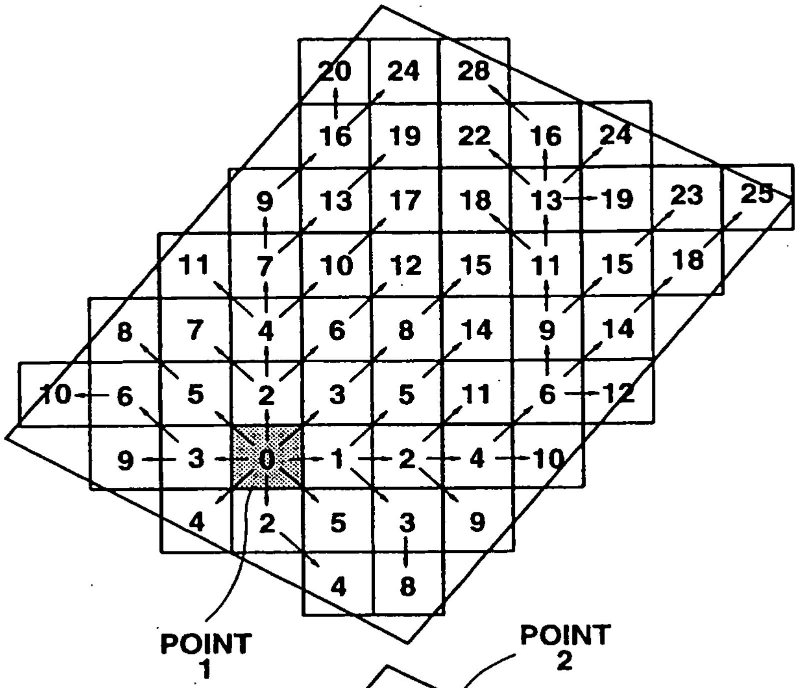

17
PICTURE IMAGE DATA STORAGE MEANS
158
POINT 1
POINT 2
162
163
NORMAL VECTOR CALCULATING MEANS
PIXEL VALUE CHANGE VECTOR CALCULATING MEANS
CALCULATION RANGE PARAMETER
159
POINT 1
PIXEL VALUE CHANGE VECTOR
GRADIENT CALCULATING MEANS
NORMAL VECTOR
164
21
GRADIENT DATA STORAGE MEANS
165
PASSING COST MAP CALCULATING MEANS
25
PASSING COST MAP STORAGE MEANS

[FIG. 25]

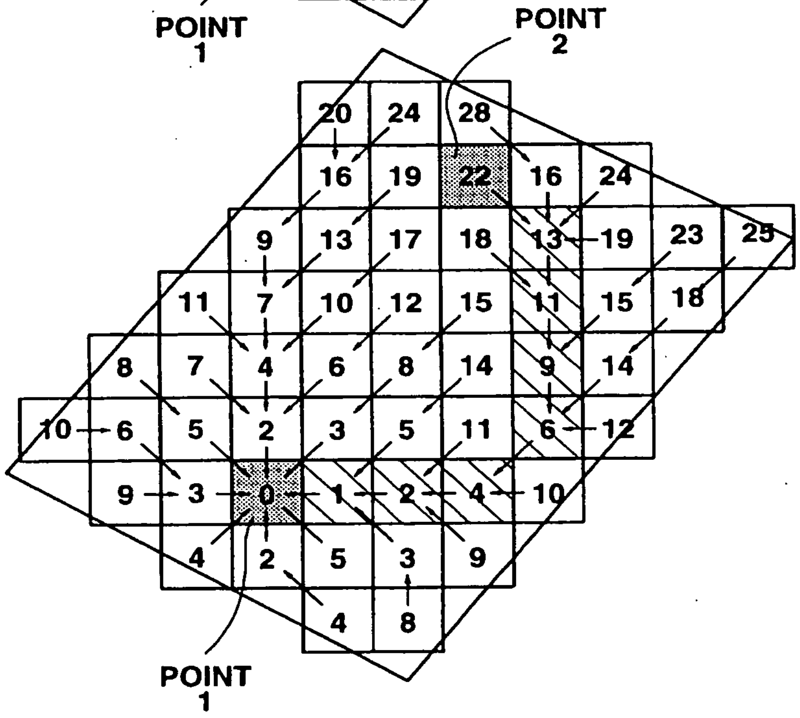

START
CALCULATION OF NORMAL VECTOR
S31
CALCULATION OF PIXEL VALUE CHANGE VECTOR
S32
END

[FIG. 26]

(A)



(B)



[FIG. 27]

The Live-Wire 2-D dynamic programming (DP) graph search algorithm is as follows:

Algorithm: Live-Wire 2-D DP graph search.

Input:

s	{Start(or seed) pixel.}
l(q,r)	{Local cost function for link between pixels q and r.}

Data Structures:

L	{List of active pixels sorted by total cost (initially empty).}
N(q)	{Neighborhood set of q (contains 8 neighbors of pixel).}
e(q)	{Boolean function indicating if q has been expanded/processed.}
g(q)	{Total cost function from seed point to q.}

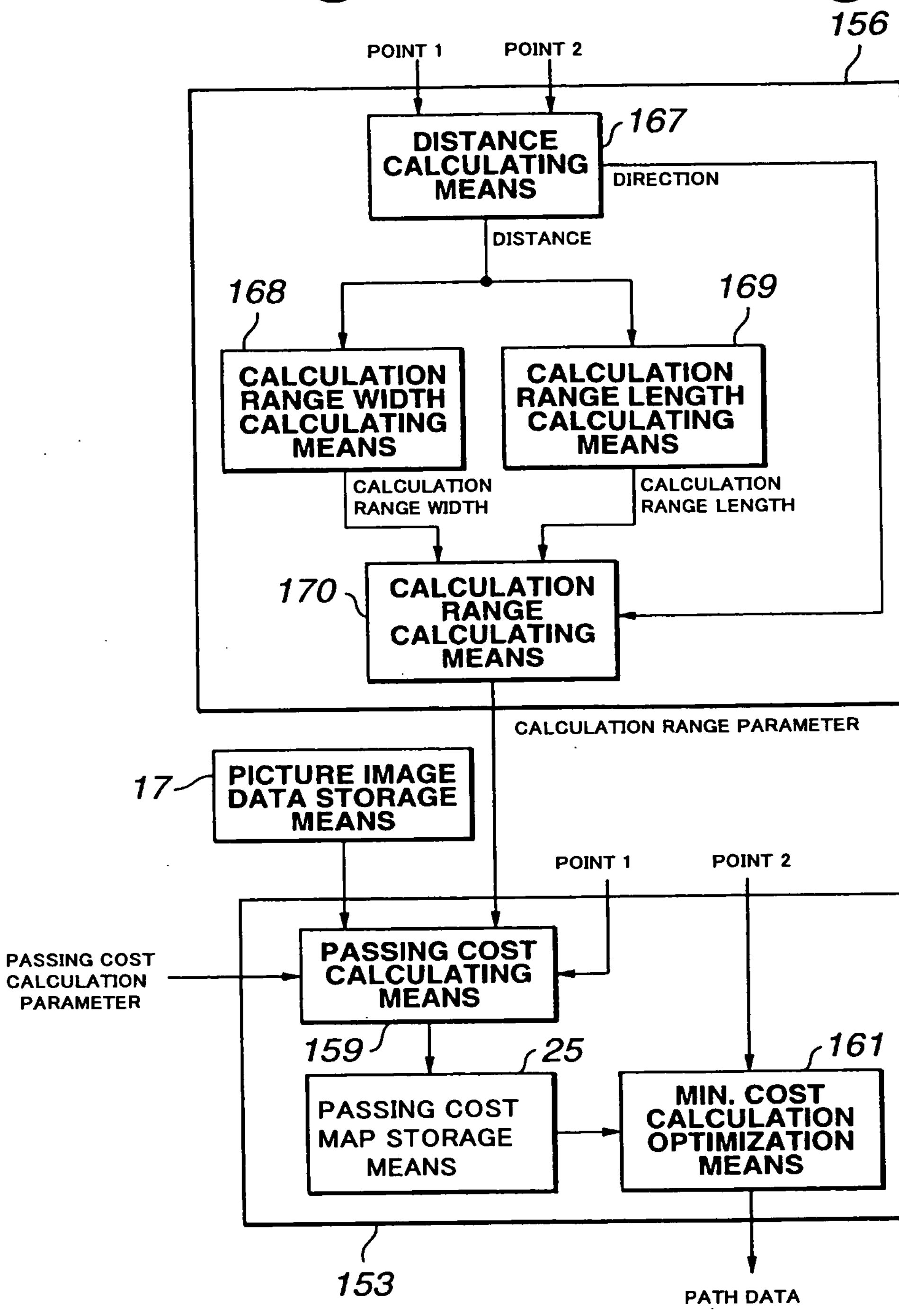
Output:

p	{Pointers from each pixel indicating the minimum cost path.}

Algorithm:

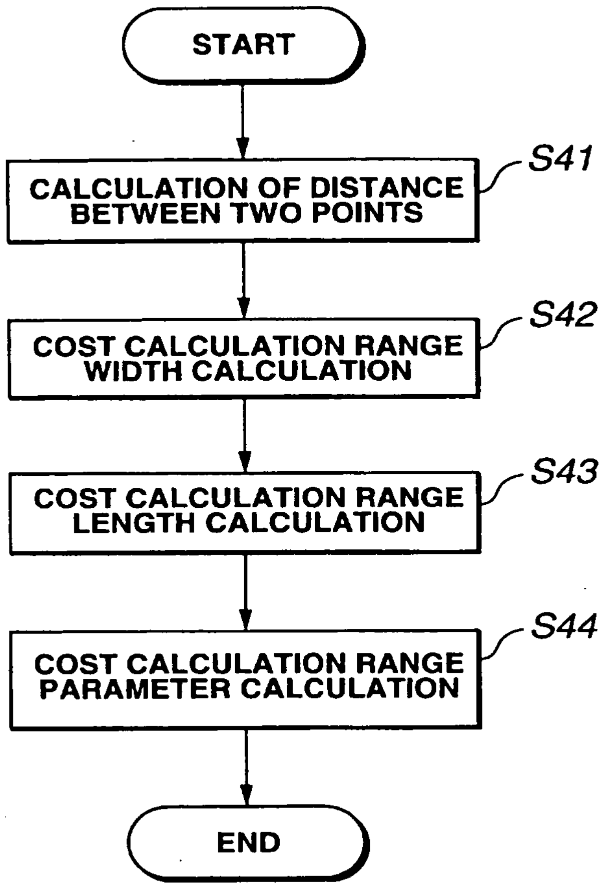
```
g(s)=0;  L=s;                        {Initialize active list with zero cost seed pixel.}
while L!=NULL do begin               {While still points to expand:}
  q=min(L)                           {Remove minimum cost pixel q from active list.}
  e(q)=TRUE;                         {Mark q as expanded(i.e.,processed).}
   for each r∈N(q) such that not e(r) do begin
     gtmp=g(q)+l(q,r);               {Compute total cost to neighbor.}
      if r∈L and gtmp < g(r) then    {Remove higher cost neighbor's}
        r=L;                         { from list}
      if !(r∈L) then begin           {If neighbor not on list,}
        g(r)=gtmp;                   { assign neighbor's total cost,}
        p(r)=q;                      { set (or reset) back pointer,}
        L=r;                         { and place on (or return to)}
      end                            { active list.}
    end
  end
```

[FIG. 28]

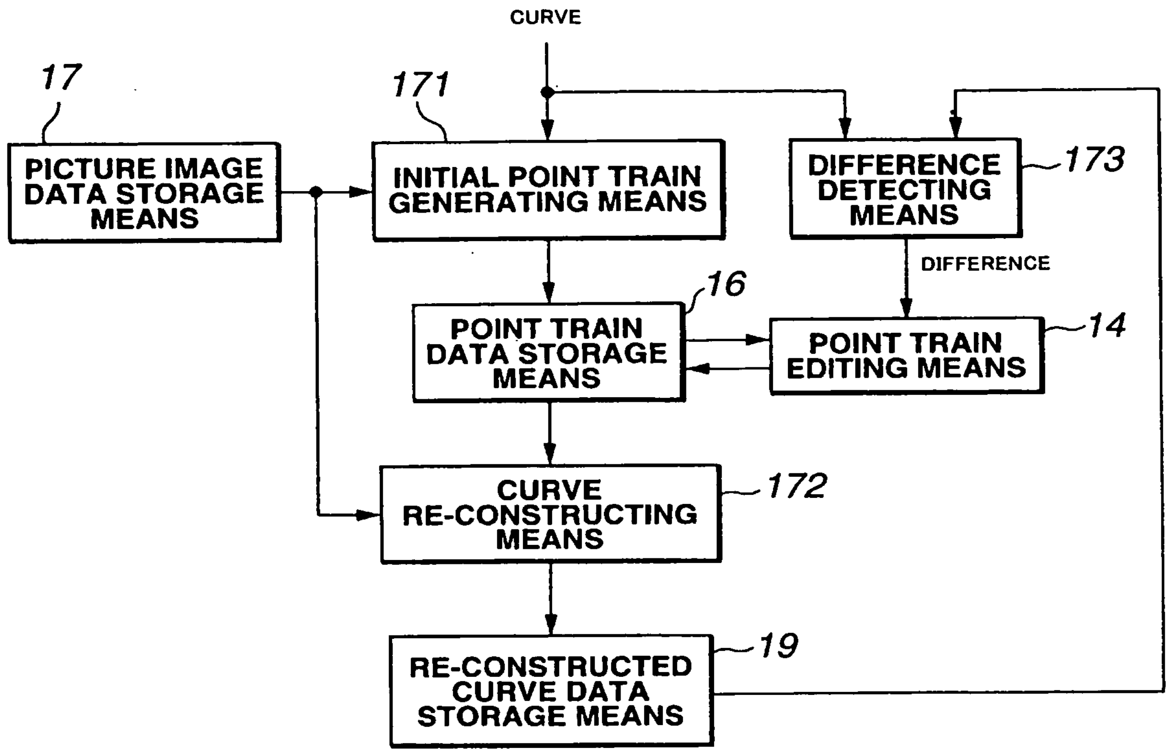


156
POINT 1
POINT 2
DISTANCE CALCULATING MEANS
167
DIRECTION
DISTANCE
168
169
CALCULATION RANGE WIDTH CALCULATING MEANS
CALCULATION RANGE LENGTH CALCULATING MEANS
CALCULATION RANGE WIDTH
CALCULATION RANGE LENGTH
170
CALCULATION RANGE CALCULATING MEANS
CALCULATION RANGE PARAMETER
17
PICTURE IMAGE DATA STORAGE MEANS
POINT 1
POINT 2
PASSING COST CALCULATION PARAMETER
PASSING COST CALCULATING MEANS
159
25
161
PASSING COST MAP STORAGE MEANS
MIN. COST CALCULATION OPTIMIZATION MEANS
153
PATH DATA

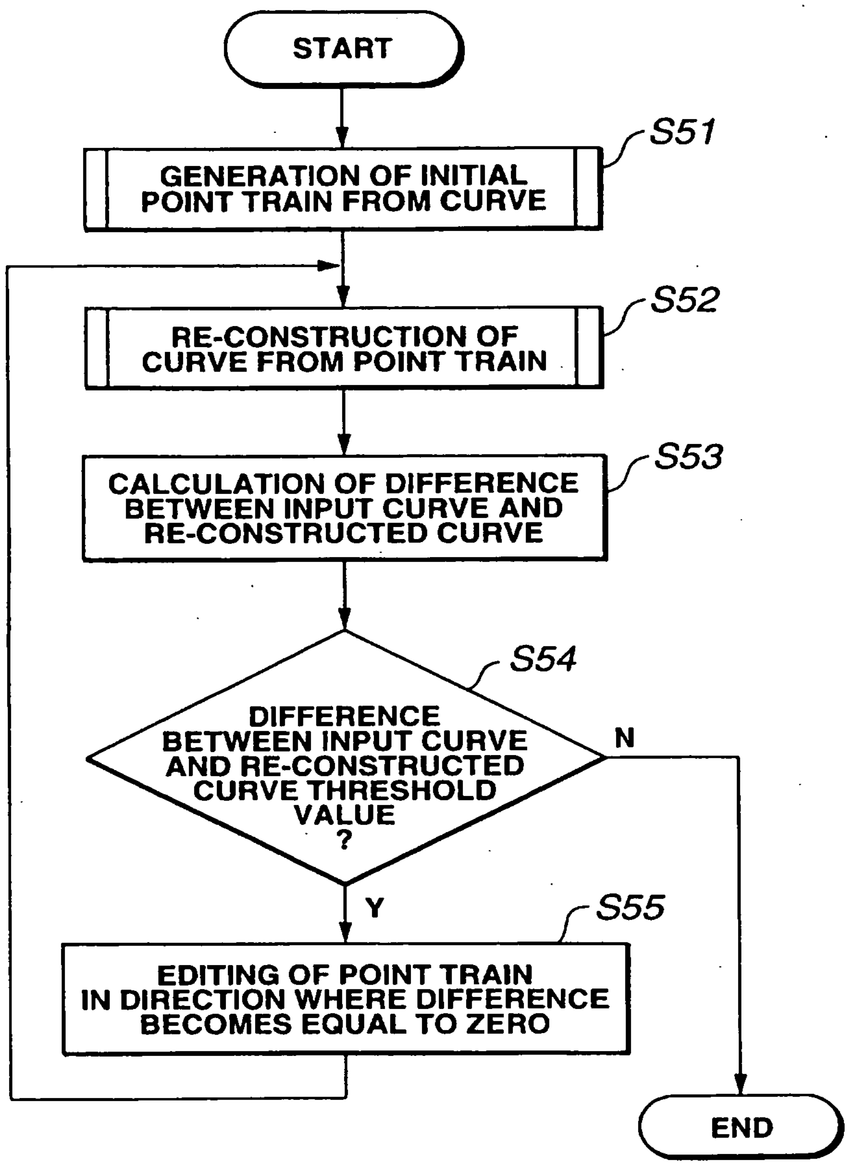
[FIG. 29]


START
CALCULATION OF DISTANCE BETWEEN TWO POINTS
S41
COST CALCULATION RANGE WIDTH CALCULATION
S42
COST CALCULATION RANGE LENGTH CALCULATION
S43
COST CALCULATION RANGE PARAMETER CALCULATION
S44
END

[FIG. 30]

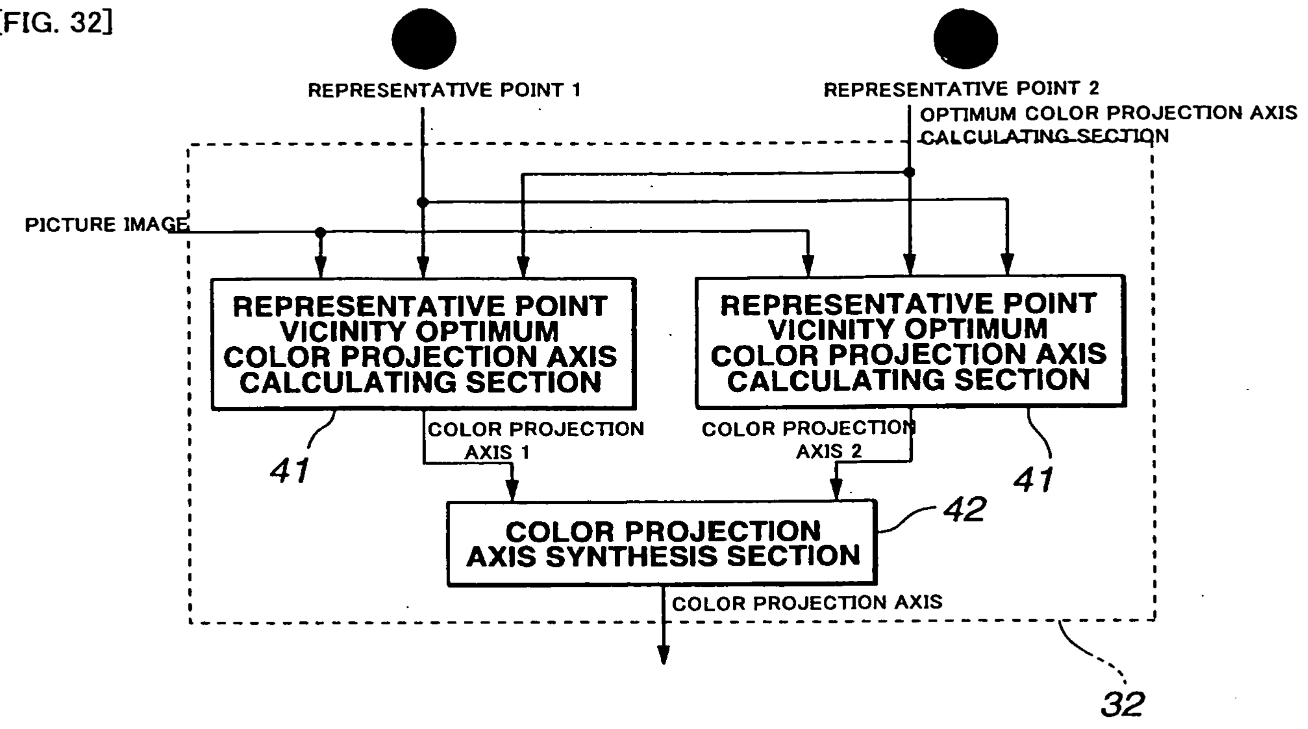

CURVE
17
PICTURE IMAGE DATA STORAGE MEANS
171
INITIAL POINT TRAIN GENERATING MEANS
DIFFERENCE DETECTING MEANS
173
DIFFERENCE
16
POINT TRAIN DATA STORAGE MEANS
POINT TRAIN EDITING MEANS
14
CURVE RE-CONSTRUCTING MEANS
172
RE-CONSTRUCTED CURVE DATA STORAGE MEANS
19

[FIG. 31]

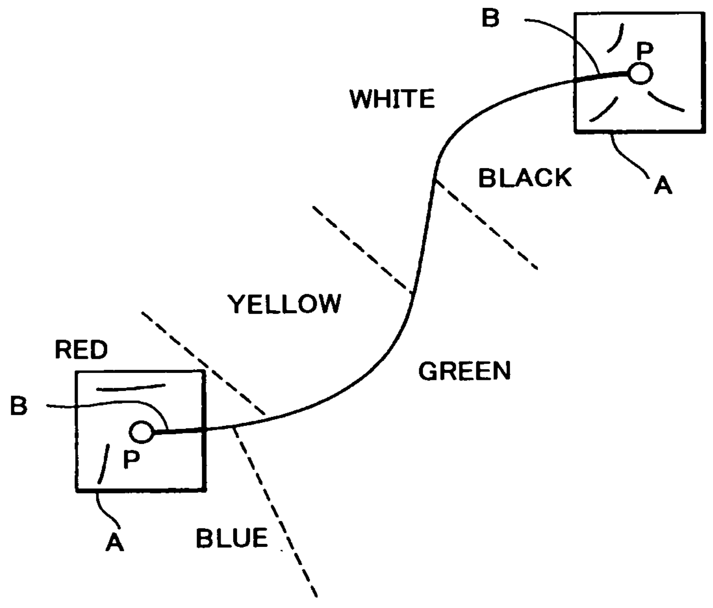


START
S51
GENERATION OF INITIAL POINT TRAIN FROM CURVE
S52
RE-CONSTRUCTION OF CURVE FROM POINT TRAIN
S53
CALCULATION OF DIFFERENCE BETWEEN INPUT CURVE AND RE-CONSTRUCTED CURVE
S54
DIFFERENCE BETWEEN INPUT CURVE AND RE-CONSTRUCTED CURVE THRESHOLD VALUE ?
N
Y
S55
EDITING OF POINT TRAIN IN DIRECTION WHERE DIFFERENCE BECOMES EQUAL TO ZERO
END

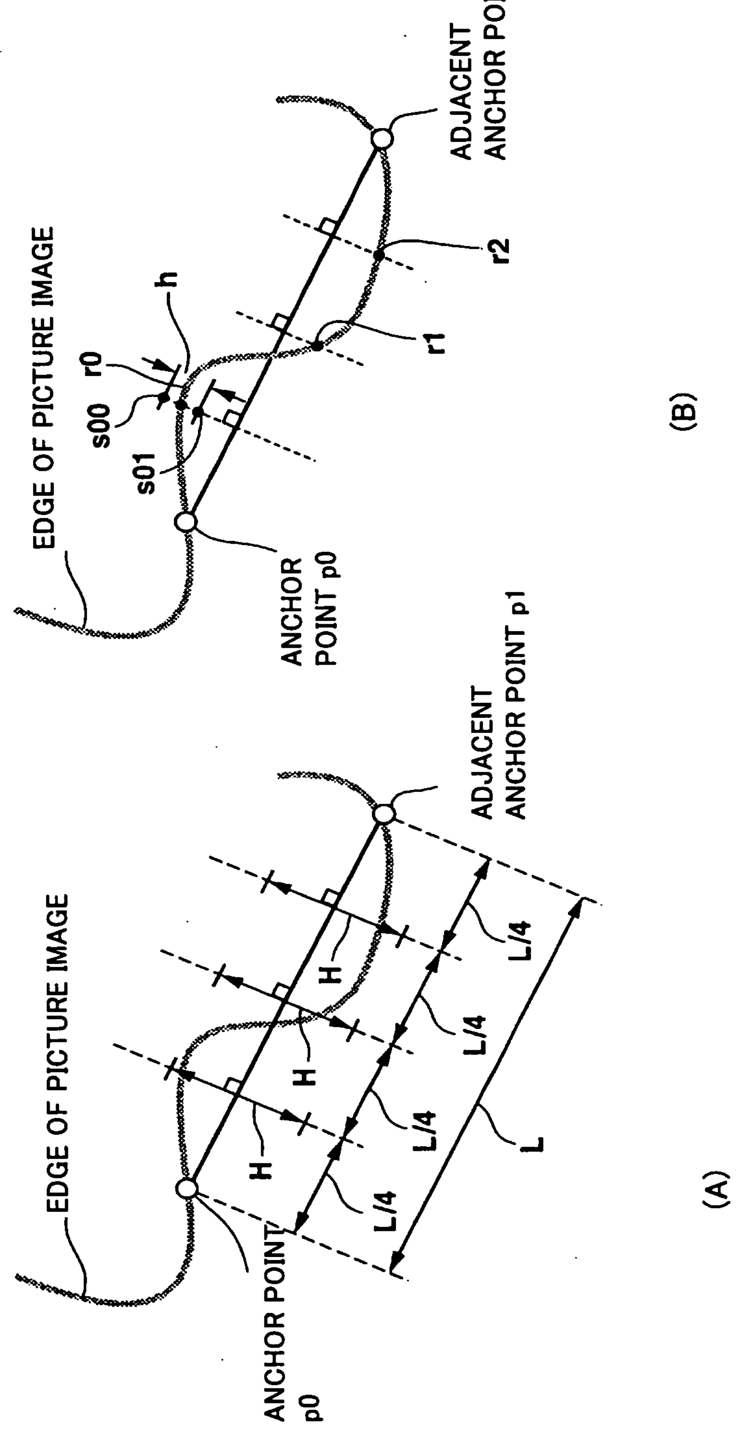
[FIG. 32]


REPRESENTATIVE POINT 1
REPRESENTATIVE POINT 2
OPTIMUM COLOR PROJECTION AXIS CALCULATING SECTION
PICTURE IMAGE
REPRESENTATIVE POINT VICINITY OPTIMUM COLOR PROJECTION AXIS CALCULATING SECTION
REPRESENTATIVE POINT VICINITY OPTIMUM COLOR PROJECTION AXIS CALCULATING SECTION
COLOR PROJECTION AXIS 1
COLOR PROJECTION AXIS 2
41
41
COLOR PROJECTION AXIS SYNTHESIS SECTION
42
COLOR PROJECTION AXIS
32

[FIG. 33]

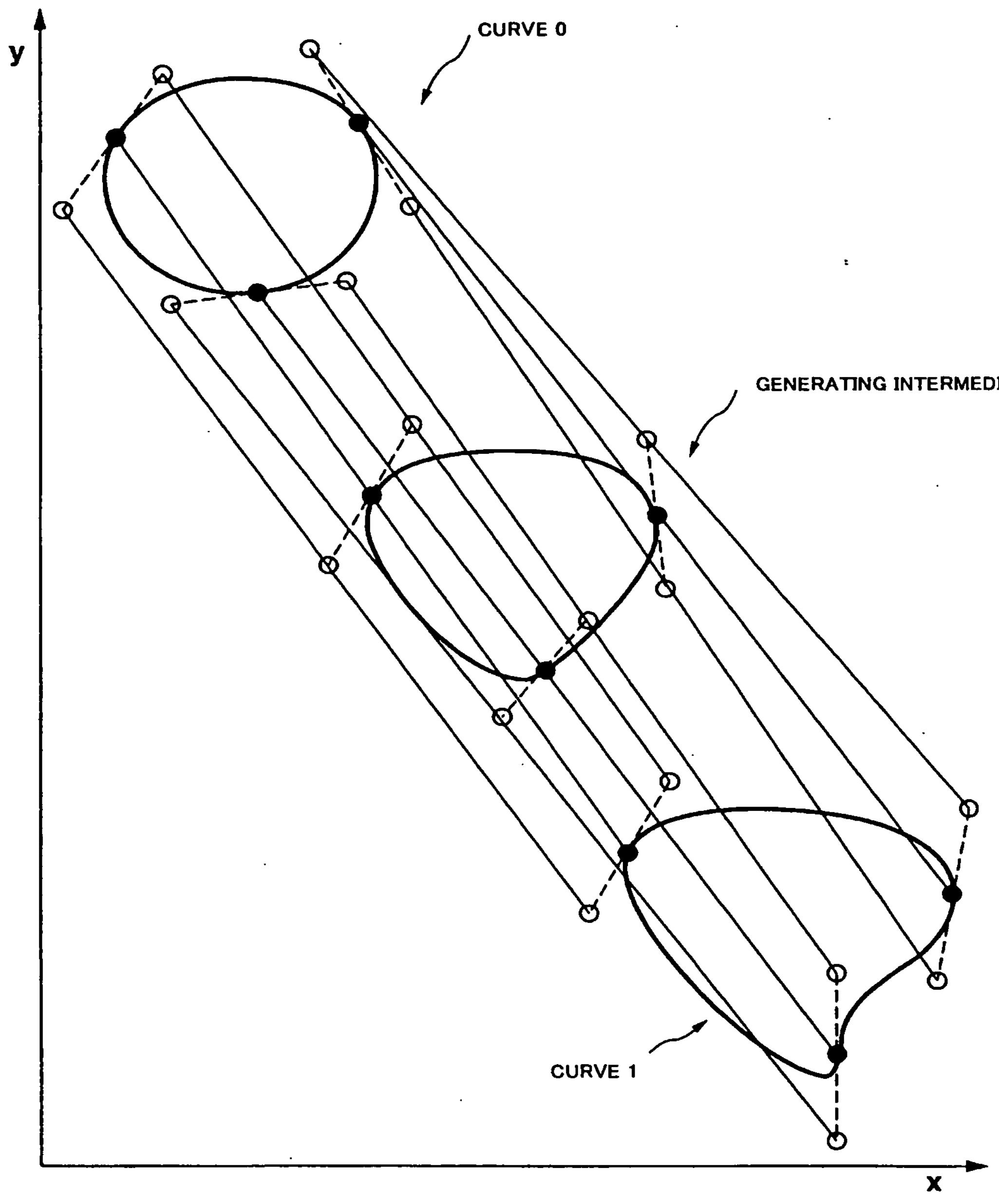

B
P
WHITE
BLACK
A
YELLOW
RED
GREEN
B
P
A
BLUE

[FIG. 34]

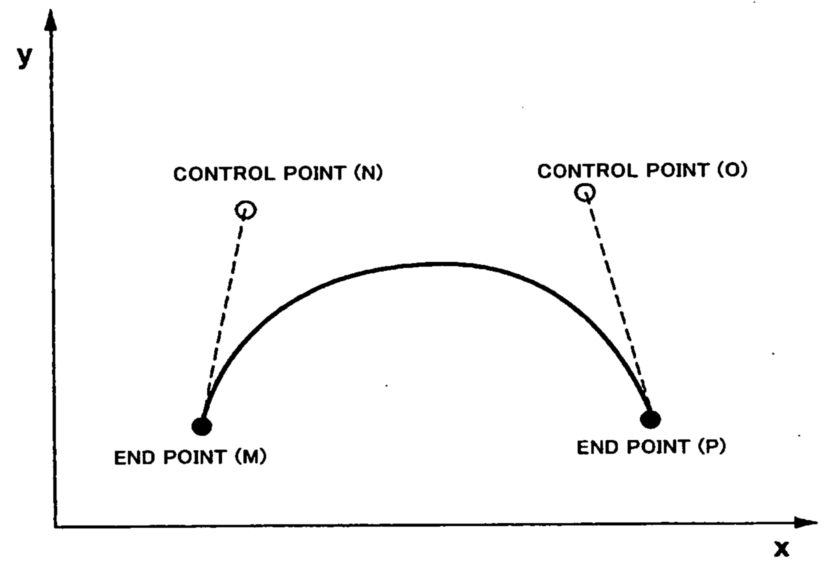


EDGE OF PICTURE IMAGE
ANCHOR POINT p0
ADJACENT ANCHOR POINT p1
H
H
H
L/4
L/4
L/4
L/4
L
(A)
EDGE OF PICTURE IMAGE
ANCHOR POINT p0
ADJACENT ANCHOR POINT P1
h
r0
s00
s01
r1
r2
(B)

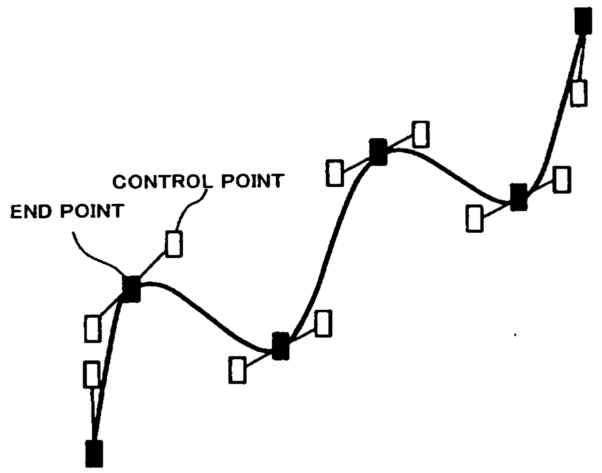
[FIG. 35]



[FIG. 36]


y
CONTROL POINT (N)
CONTROL POINT (O)
END POINT (M)
END POINT (P)
x

[FIG. 37]


CONTROL POINT
END POINT